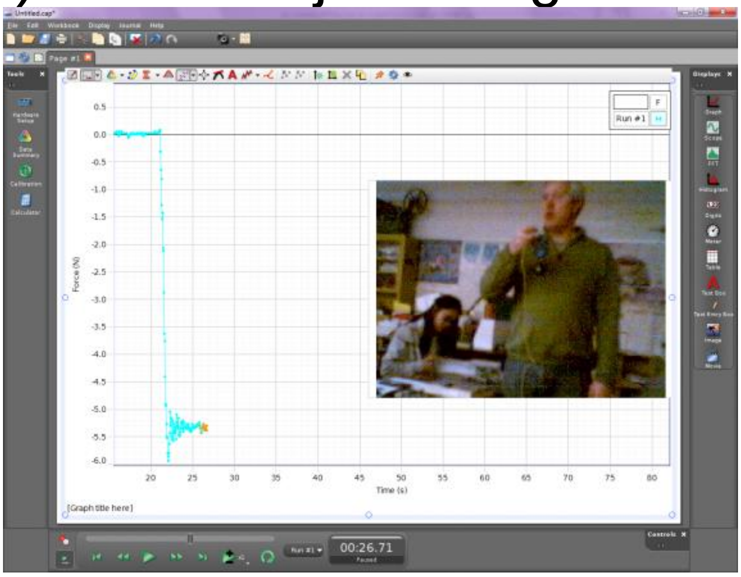
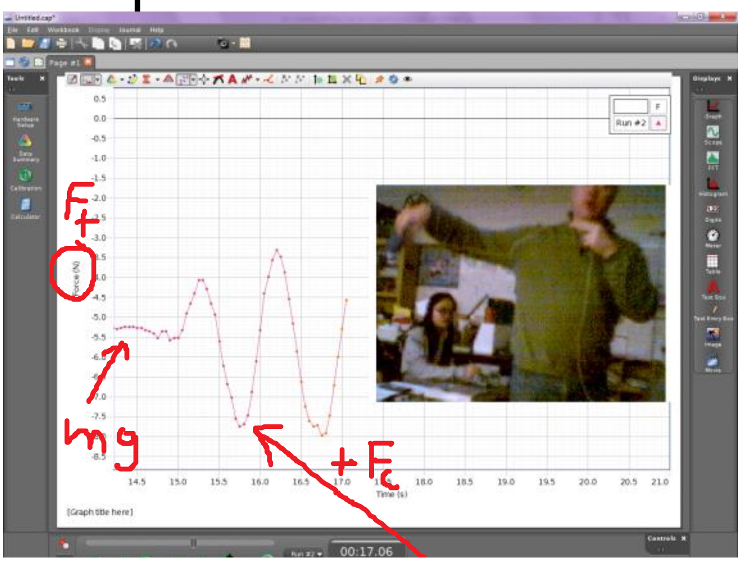
eg. I swing a 500.0g mass on a digital force scale in a circular path radius 50.0cm. What does the scale read when

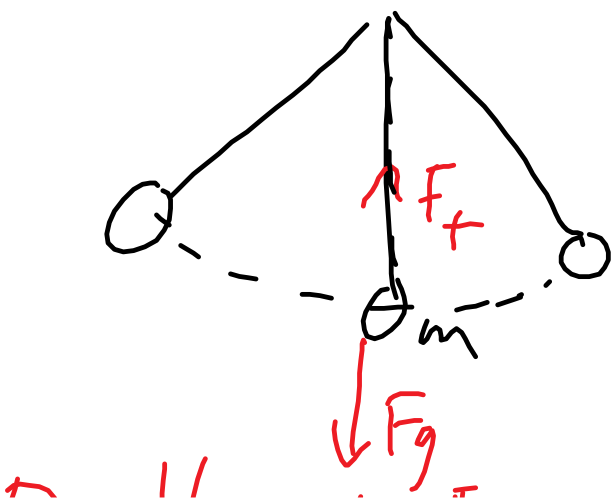
a) the mass just hangs without swinging?

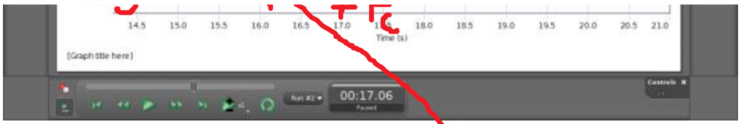


this mass is a bit heavier than 500g because it is around 5.3N rather than Fg=mg = 0.50kgx9.8N/kg =4.9N

a) I swing the mass at the bottom of the swing with a speed of 2.0 m/s.







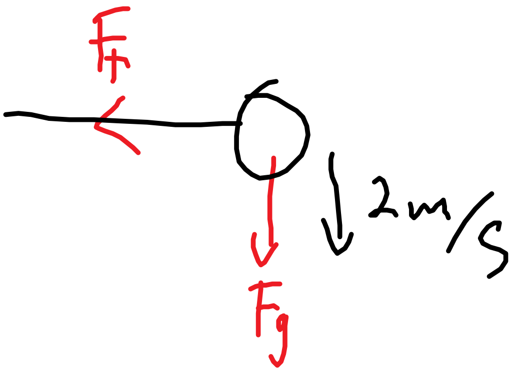
Don't put F_c in free body diagram it is the resultant

$F_{net} = mv^2/r = F_t - F_g$

$F_t = mg + mv^2/r$

$F_t = 0.5x(9.81+(2x2/0.5))=8.905 = 8.9N$

a) the mass swing at the side at 2.0 m/s

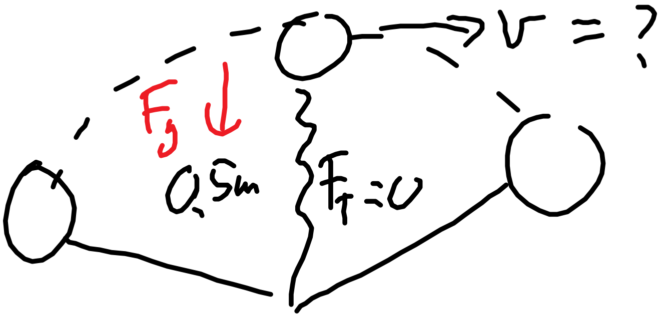


F_c is towards centre of circle

$F_c = F_t = \frac{mv^2}{r} = \frac{0.5(2)^2}{0.5}$

$F_t = 4.0N$

a) what is the minimum speed at the top for it to stay in circular motion? (hint - tension =0)



F_g is only force

$F_g = F_{net} = F_c$ (also for orbits)
$mg = mv^2/r$ so v= Sqrt(9.81x0.5)= 2.2147234590350 1 m/s = 2.2 m/s

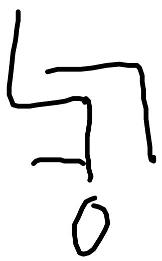
a) what is the tension at the top if it is moving at 2.0 m/s?

it is moving less than the minimum speed so the "string" would have to push out to keep it in circular motion

$$F_g - F = F_c$$
$$F = F_g - F_c$$

F_{app} = (0.5x9.81)-(0.5x2x2/0.5)=0.905 N up

this is much less than 4.9N weight, so the mass almost is weightless. At the top of the ferris wheel, you feel less normal force, so you feel a bit weightless.



$$F_N + F_g = F_c$$

Enterprize at Playland

roller coaster

a) what period of revolution is required to move the mass at 2.0 m/s

$v = d/t = 2\pi r/T$ by the way, $F_c = mv^2/r = m(2\pi r/T)^2/r$

$v = d/t = 2\pi r/T$ by the way, $F_c = mv^2/r = m(2\pi r/T)^2/r$

$F_c = m\,4\pi^2 r/T^2$

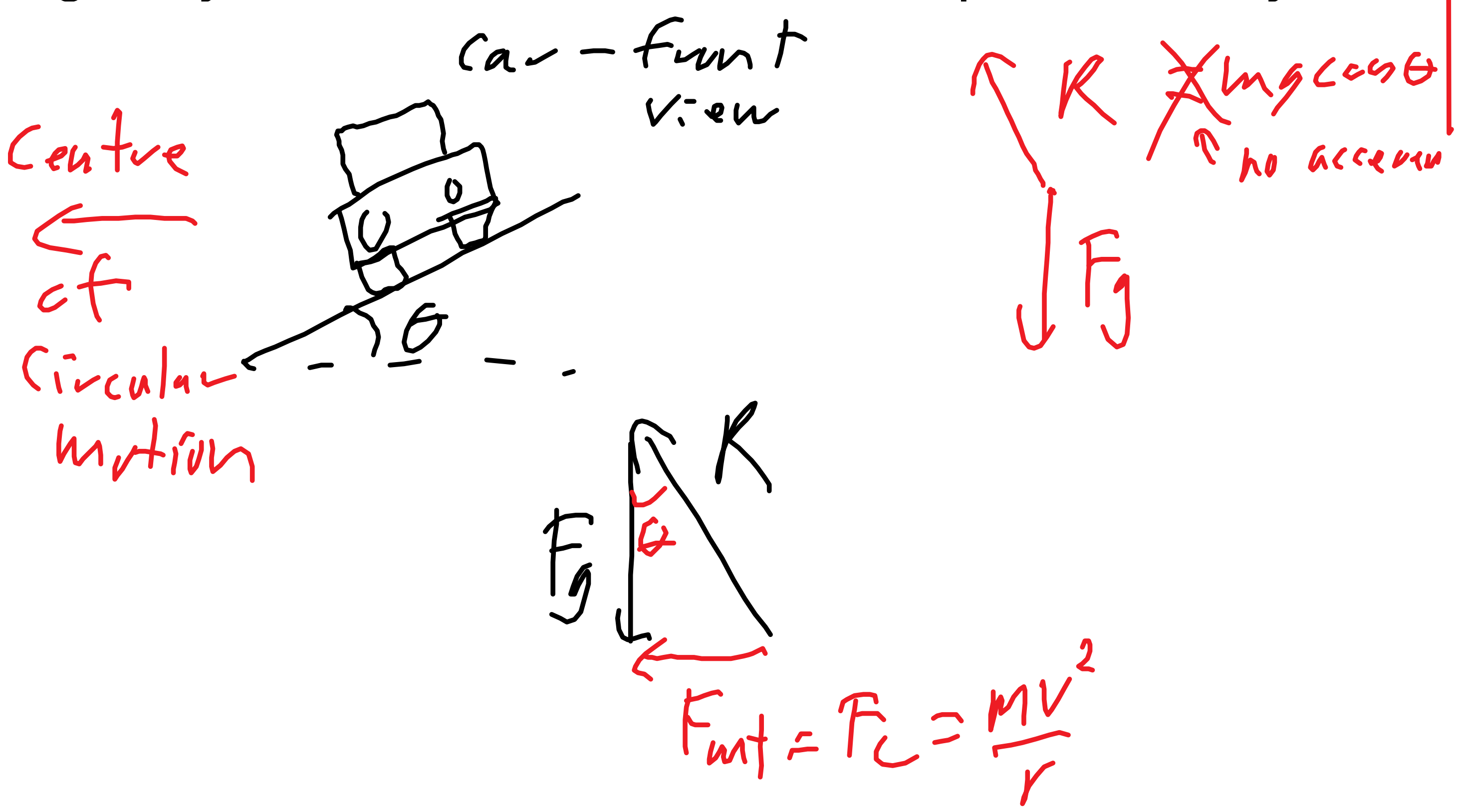
T= $2\pi 0.5/2$= 2x3.14159x0.5/2=1.5708 = 1.6s

Test November 28th or 30th
Quiz November 22nd
lab next class Nov 14th due 20th

Notes:

Banking and Pig Lab

Have you noticed driving/(being driven?) on the highway, the road is sometimes sloped sideways.



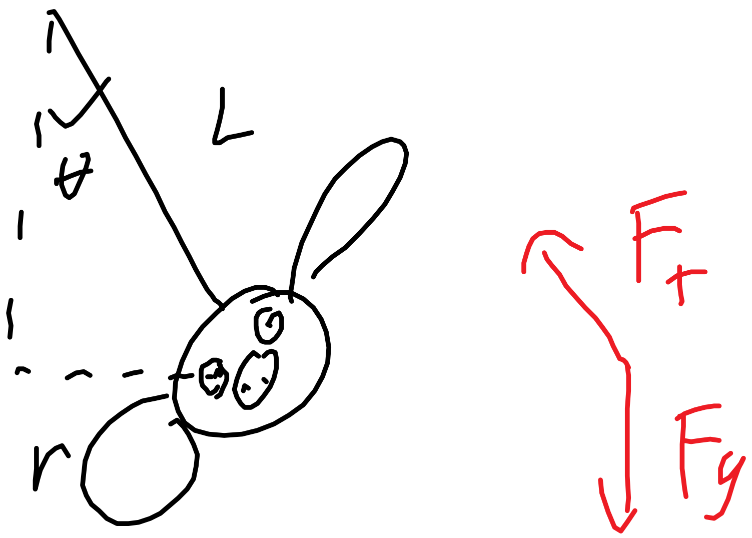
$$\tan\theta = \frac{F_c}{F_g} = \frac{mv^2/r}{mg}$$

$$\boxed{\tan\theta = \frac{v^2}{rg}}$$

banking or Pig on string

no friction required

Pig lab



$$\sin\theta = \frac{r}{L} \sim \tan\theta = \frac{v^2}{rg}$$

↑ small θ approximation

$$\frac{r}{L} = \frac{v^2}{rg} = \frac{4\pi^2 r}{gT^2}$$

$$T^2 = 4\pi^2 L \ldots$$

or $T = 2\pi\sqrt{L \ldots}$

$$T^2 = \frac{4\pi^2}{g} L \qquad T = \frac{2\pi\sqrt{L}}{\sqrt{g}}$$

Homework:
Giancoli q1-5 p 119, and problems 1-15 odds. p120-121

time for 3 revolutions (s)	$T^2 (s^2)$	L(m)